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REPLY TO
ATTENTION OF:

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30 June 1989

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GRADUATE PROGRAM IN HEALTH CARE ADMINISTRATION
(HSHA-IHC), ACADEMY OF HEALTH SCIENCES, U.S.
ARMY, FORT SAM HOUSTON, TX 78234-6100

SUBJECT: Resident Management Project

This Graduate Management Project is submitted by MAJ(P)
F. Davison to the Residency Committee in partial fulfillment of
her residency requirements.

Encl


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"REPRODUCED AT GOVERNMENT EXPENSE"

A STUDY TO DETERMINE
THE BEST METHOD OF IMPROVING
THE FLOW OF PATIENTS THROUGH THE
SURGICAL CRITICAL CARE UNITS
AT
LETTERMAN ARMY MEDICAL CENTER

A Graduate Management Project
Submitted to the Faculty of
Baylor University
in Partial Fulfillment of the
Requirements for the Degree

of
Master of Health Administration

by
Major (P) Frances E. Davison, AN
July 1989



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CHAPTER I
INTRODUCTION

Conditions Which Prompted the Study:

Letterman Army Medical Center (LAMC) is a 350 bed, tertiary care teaching hospital, with an average daily census of 250 patients. LAMC officials are concerned that the organization of the surgical critical care units may inhibit the processing of patients from the Intensive Care Units (ICUs) into less critical settings, such as the surgical wards. Authorities at Letterman are concerned that delays exist in the flow of critical care surgical patients due to organizational constraints. As a result, it is felt that a reduction in surgical procedures due to inadequate recovery capacity and the diversion of critical care patients from the Emergency Room to other hospitals in the immediate area has occurred (Shetler and McCauley, Aug 1988). Additional effects include the maintenance of patients who should appropriately be provided critical care, in non-critical care beds due to the lack of critical bed capacity; or the inappropriate transfer of the ill out of and back to critical care areas as bed capacity is exhausted and restored. This study examines the issues and reasons surrounding the impeded flow of patients through the surgical critical care units, and to suggest an effective method to alleviate the problem.

Letterman's patient population reflects the large retired population that reside in the San Francisco Bay Area, with the concomitant complex health problems of the elderly. The average patient acuity is among the highest in the Army Medical

Department (AMEDD) (Meyer 1988, E-2) due to the elderly population and the dearth of young, healthy active duty troops. The average cost per Medical Care Composit Unit (MCCU) is \$36.46, well above the AMEDD average of \$30.88 (Souel, 1989), a reflection of the high acuity, the high cost of state-of-the-art technology, and the high civilian pay scale in the San Francisco Bay Area ("Headline News", Jan 1989, 17).

Letterman has a proud tradition of support to the military and the people of San Francisco that pre-dates the San Francisco earthquake and fire, spans two world wars and our military involvement in both Korea and Viet Nam. Among the first to develop programs to train military physicians, there are approximately 150 interns, residents, and fellows currently in various medical and surgical subspeciality training programs. LAMC supports its primary goal of Graduate Medical Education (GME) through excellence in patient care.

In support of Letterman's elderly population and teaching programs that include cardio-thoracic surgery, neurosurgery, and one of the Army's two intensivists programs, the hospital's Intensive Care Units are frequently filled with high risk, high acuity, long term patients. The ICUs maintain standards established by the California Health Care Statutes, the Task Force on Guidelines of the Society of Critical Care Medicine, and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

The surgical critical care beds at LAMC are limited to

a total of ten (10) beds. Four (4) beds are located in the Post-Anesthetic Recovery Room, or PAR (also called the Surgical Intensive Care Unit "SICU"), and six (6) beds in the Medical-Surgical Intensive Care Unit. There is no other designated nursing care unit that provides intensive care for protracted periods of time for those patients who are not expected to survive. The limited capacity for critical care became an acute problem in December 1987, when the critical care units were filled with acutely ill, long-term patients, many of whom did not recover. A lack of adequate bed resources caused LAMC to divert patients from the Emergency Room and to postpone surgeries for which intensive post-operative care would be needed. In response to similar pressures, other health service facilities have attempted to alleviate such an untenable situation with multi-level patient processing, by establishing intermediate care units, or by expansion of existing critical care areas. The single AMEDD facility to use such a solution, Madigan Army Medical Center has established a Step Down Unit (SDU) with an operating capacity of 16 beds (Maestas and Ardner, 1988). With either solution, difficult ethical and financial questions must be addressed proactively in the attempt to manage limited resources.

Problem Statement

To determine the best method of improving the flow of patients through the surgical critical care units at Letterman Army Medical Center.

Objectives

1. Review the literature pertinent to:
 - a. productivity within hospital critical care units.
 - b. improvement of the level of productivity within critical care units.
2. Determine the characteristics of the critical care units at LAMC:
 - a. case mix
 - b. bed space
 - c. staffing
 - d. number of surgical cases cancelled and/or diverted to other hospitals secondary to lack of resources (bed space and staffing) at LAMC.
3. Apply statistical analysis to data to determine efficiency of individual critical care units.

4. Determine the options which represent the most feasible solution to improving the flow of patients through the critical care units. Some options may include but are not limited to:

- a. Establish a surgical step down unit.
- b. Increase the number of recovery room beds.
- c. Reallocate nurse staffing to allow greater flexibility in the scheduling of surgical cases.
- d. Status quo.

5. Make recommendations.

Criteria

1. The standards established to evaluate the recommended method for improving the flow of patients through the surgical critical care areas at LAMC will assess the efficiency and effectiveness of the management of available resources.

2. Efficiency will be evaluated on the basis of a comparison of the number of days the patient spent in the ICU as compared to the number of days that patient could have been cared for on a less high intensity care nursing unit.

3. Effectiveness will be measured in terms of goal achievement, that is, a measure of wellness following care in the ICU.

Assumptions

The following assumptions are made for this management project:

1. The surgical residency and/or the intensivist fellowship programs at LAMC will not downsize or terminate during the course of this project.
2. Use of resources (supplies, labor, capital) to provide units of service (patient care, research, teaching) can be determined with enough accuracy to permit evaluation of the existing surgical critical care units and any proposed changes to the system.
3. Surgeries cancelled or deferred for reasons other than lack of resources will not enter into the evaluation process.
4. Productivity of providers will not change.
5. Productivity of ancillary personnel will not change.
6. Productivity of administrative support personnel will not change.
7. Resource availability and access will not change.

Limitations

1. Retrieval of resource utilization data may be limited due to the accuracy of the manual collection of data within the elements of the surgical service at LAMC.

2. Accuracy and usefulness of data generated by the patient classification system may be limited by measurement constraints initially incurred in the Nursing Workload Management System when it was implemented throughout the facility.

Review of the Literature

Concern for efficient utilization of limited resources at Letterman Army Medical Center reflects a broader concern of public and private health care policy planners regarding human services resource utilization. This management study is illustrative of the difficult individual, organizational, and social policy choices that must be made to encourage the efficient and effective delivery of health services in our health care system.

American health care policy is rooted in three economic ideologies that reflect the needs and desires of the society (Fuchs, 1984). The first is that resources are scarce in relation to those needed to satisfy the demands of society. It is indisputable that some resources are over or underutilized, or that inefficiency and waste occur in society. However, if all the imperfections in health care were eliminated, there still might not be enough resources to meet the desires of society. Secondly, resources have alternative uses. If a society wants something, it must be willing to accept the opportunity costs that occur with the advent of that commodity. If the choice is made for more hospital beds, they are obtained at the expense of other choices that would utilize the same staff, space, and capital. Thirdly, individuals place a different relative value on the choices made, making it difficult to reach consensus in a pluralistic society.

Priority setting in public and private health care

reflects the basic ideologies of the society. Priority setting means deciding *who* is to get *what* at *whose expense* (Williams 1988, 173). In the context of health care, "who" refers to different groups in society, and "what" identifies the level of health care provided. "Whose expense" is less clear, but can be identified financially in terms of who will support the cost of the health care delivery system, ie., the government (the taxpayer), or the patient (usually divided between many premium-payers). In economic analysis however, "whose expense" must be interpreted in terms of opportunity cost rather than financial cost, ie., "who is to go without" so that others may have health care. Maynard writes that in health care, the allocators of precious resources decide "who will die and who will live in what degree of pain and discomfort" (1987, 1537). It becomes clear that priority setting must be based on efficient allocation of finite resources to provide effective health care programs for the greatest number of people possible.

As technology and the number of patients utilizing that technology grow, the proportion of the gross national product (GNP) devoted to health care in the United States grows also. In 1965, \$41.9 billion, or 5.9% of the U.S. GNP was spent on medical care; in 1985, \$425 billion, or 10.7% of the U.S. GNP was expended on medical care. The United States has reached a frontier where physician decision-making can no longer be insulated from cost considerations. Medicine must be practiced

in a manner that maximizes the outcome and benefit for the patient within this new world of limited resources (Munoz et al., 1987, 342).

Intensive care units (ICUs) provide verification of society's ideology, that of providing the highest caliber of care for those who require it. The ICU originated as an post-operative recovery room, but rapidly gained favor in the early 1960s as electro-cardiographic monitoring of patients became possible. As the physician's enthusiasm for new technology and the quantity of complex operations that required intense support and observation grew, so did the demand for ICU services. A large portion of the increasing health care dollar is the result of investment in capital intensive technology and the requirement for highly trained personnel for its optimal use. As a site of life-saving support for critically ill patients, the ICU exists at extraordinary cost, both in financial and economic terms (Ost and Straus, 1987; Strauss et al., 1986).

These observations and the questions raised are significant. Relman, in 1980, and Englehardt and Rie in 1986, stress that as a matter of public policy priority, it is now necessary to justify the cost of promoting optimal standards of care at the expense of other (perhaps more widely beneficial) modes of hospital care. It is essential that health care planners recognize the difficulty in providing optimal care to a few, at the expense of many. Traditional medical ethics have

focused on personal ethical dilemmas, but the ethics of resource allocation is tied to the broader principle of justice and equality of care. An ethical commitment to the individual patient, coupled with increasing competition for resources, has prompted a consensus among physicians and bioethicists that objective analysis of benefit to the individual and to society must be part of decisions for care modalities (Weil et al., 1988). Veatch cautions that the influence of DRGs on the ethics of resource allocation could be viewed as a scale of relative weight of patients' ethical claim for care, at the risk of losing a patient-centered approach to ethical decision-making in the ICU (1986, 89).

Evaluation of policies and programs has become an integral part of the health care administration process, providing vital information for program planning, implementation, and control activities. In recent years, evaluation of health service programs that allocate resources has been emphasized to demonstrate accomplishment, to serve as a basis for ongoing development, and as a political decision-making tool. The work of Veney and Kaluzny provides a theoretical framework for program evaluation. They define evaluation as the 'collection and analysis of information by various methodological strategies to determine the relevance, progress, efficiency, effectiveness, and impact of program activities' (Veney and Kaluzny 1984, 2).

Relevance refers to the necessity of a program, identifying the basic rationale for having a program or standard to meet the need or service demand of the community. Progress indicates the tracking of program activities to assess the degree of compliance between the plan or policy and its implementation. Efficiency is defined as the relationship between results obtained from a specific program and the resources expended to maintain the program, an evaluation of whether program results could be obtained less expensively. Effectiveness is expressed as whether a program achieves predetermined objectives, the emphasis being on immediate results of program effort. Impact evaluation is based on changes observed over time in characteristics that the program was designed to influence. These indices provide valuable information individually, but health care services must be evaluated with aggregate information from all five measures.

The value of evaluation is in its provision of information with which to make decisions about program or policy management. Formative evaluation, or evaluation that is concurrent with program development, is considered an integral part of the management cycle, influencing the related elements of planning, implementation, and control (Veney and Kaluzny 1984, 8). As the health care dollar dwindles, and programs must compete for limited resources, the role of efficiency evaluation becomes increasingly more powerful in determining which programs will be continued, expanded, or terminated (Long

et al., 1987; Robertson, 1987; Turley and Edwardson, 1985).

An extensive review of the literature reveals that the industry has not yet learned how to accurately measure productivity. Most evaluative tools focus on efficiency measures, yet omit the other measures suggested by Veney and Kaluzny. The Diagnosis Related Group (DRG) reimbursement scale, when coupled with outcome measures, offers a framework for the most objective evaluation of health care productivity to date (Green et al., 1986; Long et al., 1987; Munoz et al., 1988). Productivity measurement is not a new idea, but certainly one that has become vital to the survival of health care programs.

An original substantive work directed toward developing measures of performance was done in 1976 in response to untenable cost increases in the provision of health care. The measures established by Griffith focus on the characteristics of economic transactions --cost, quantity, and quality -- and on the population of the hospital service community. Included in these measures was the ability to compare the production of various goods and services that make up health care (productive efficiency) and how efficiently, or at what cost, providers meet the market's desires for good health and satisfactory service (market efficiency). His work recognizes that market level economy is the most important measure of productivity, ie., if the community will not use the hospital, it can not be considered efficient (Griffith, 1978).

Because the measurement of productivity in health care has been elusive, hospitals rely on evaluation of efficiency, establishing indicators, ie., Medical Care Composite Units (MCCUs), or DRGs, that are measurable and represent the relationship between resource use (input) and results achieved (output). Used in United States Military Treatment Facilities, the MCCU defines workload as an expression of provider input in the hospital or outpatient setting; incorporating average daily admissions, occupied bed days, live births, and clinic visits. It does little to quantify resource use, patient acuity, or patient outcome.

The DRG system is a patient classification system which uses groups of clinically valid categories for the purpose of measuring resource consumption. This system also does not consider patient acuity and ignores patient outcome, although it serves as a tool for planning and resource allocation. Various attempts to combine DRGs with other productivity measures have been more successful in describing the hospital product and productivity. Long has developed a "productivity index" that identifies changes in the number and types of inputs (for a specific DRG), and resulting changes in the product, or level of completeness of a hospitalization (Long et al., 1987). Work by Munoz characterized hospital resource consumption and outcome by age and DRG for surgical patients (Munoz et al, 1988).

The Green study (unpublished) shows that when coupled

with a valid severity of illness index, the DRG patient classification scale does allow comparison of resource use between physicians and between hospitals, using patient groups whose illness intensities are approximately equal. Each of these measures is an attempt to effectively evaluate resource use and service to provide information for resource allocation and program planning.

The Resource-Based Relative Value Scale (RBRVS) developed by Hsiao and his group is a creative approach to measuring resources used to provide physician services (Hsiao et al., 1988). The scale evaluates the resources a physician expends on a particular service or procedure - mental effort and judgement, clinical skill and effort, psychological stress, time, practice costs, and the opportunity costs of income lost during speciality training (Hsiao, Couch, et al., 1988). It does not consider demand factors, effects of volume or intensity of services, or impacts on patient outcomes (Roper 1988, 2446). A useful tool in assessing payment inequities and overpriced procedures, the RBRVS lacks the ability to thoroughly assess the relevance, progress, effectiveness, and impact of health care policies and programs as suggested by Veney and Kalusny.

A further technique in program evaluation is economic analysis which provides a logical framework for appraising decisions regarding the use of scarce resources. It compels decision makers to establish objective criteria to measure the

effect of resources on the relevant episode of illness and the outcome of the health care intervention. The greatest virtue of economic analysis is that it is a logical, defensible, and explicit framework with which to evaluate health care (Maynard 1987, 1541). Cost-benefit/cost-effectiveness analysis permits an assessment of the inherent worth of a service or program (do the benefits exceed the costs?), and a comparison of competing programs (which program generates the greatest benefit over cost?) (Warner and Luce 1982, 47). This type of formative program evaluation provides valuable information with which to manage program development and evaluate its benefit.

The utilization of intensive care services has become the focus of intense scrutiny in attempts to evaluate the efficiency and effectiveness of the delivery of health care using this high cost modality. Likewise, to most appropriately allocate limited critical care resources, objective measures of illness and prognosis must be applied when deciding to provide intensive care or intensive monitoring, and when reaching decisions to continue, limit, or terminate life support. Basic guidelines for admission and discharge policies in the ICU are that patients requiring intensive treatment (priority 1) have priority over monitoring (priority 2) and terminally ill or critically ill patients with a poor prognosis for recovery (priority 3) (Task Force on Guidelines 1988, 807).

Knaus and Wagner have found it feasible to identify

low-risk patients suitable for early transfer out of the ICU by using a severity of illness index, thereby improving the efficiency of intensive care. Both studies have shown overutilization of critical care units and are able to identify groups of patients for whom admission to a critical care unit may not be necessary, or for whom length of stay might be shortened, ultimately reducing the growing demand for new ICU beds (Knaus et al, 1983; Wagner et al, 1983). Charlson and Sax suggest that efforts to improve utilization of critical care units should concentrate on appropriate triage of low-risk patients to intermediate care units, thus optimizing utilization of limited and expensive resources (Charlson and Sax, 1988).

The issues presented in this literature review are crucial concerns at LAMC as well as for American Medicine in general. As Society begins to evaluate its ideologies and its potential to deliver high quality care to each of its members, it is imperative that essential services remain available for those who will benefit, requiring difficult decisions in the allocation of health care resources to serve the best interests of our society or ourselves.

Research Methodology

1. An extensive literature search pertinent to allocation of health care resources and productivity within the hospital surgical service was conducted.

2. Patterns of the ICU and SICU utilization in the treatment of surgical critical care patients at LAMC during the calendar years of 1987-1988 are analyzed to determine actual utilization and effectiveness of the use of the ICUS.

3. Intermediate-term forecast of demand for surgical intensive care beds is projected using time series technique.

4. Application of a cost-effectiveness analysis compares the options of expanding the number of existing ICU beds or establishing a SDU to enhance the flow of patients through the surgical critical care areas.

5. Reallocation of nurse staffing patterns in the operating room and on the floors that receive patients from the recovery room and the intensive care units to allow greater flexibility in the scheduling of surgical procedures is reviewed.

6. Based upon the above analyses, the best option for improving the flow of patients through the surgical ICUs at LAMC is recommended.

CHAPTER II

DISCUSSION

Economics of critical care medicine is a complex, fluid picture reflecting the interrelationships of many critical factors. The variables that most influence the economic picture are those of population demands, standards of technology, and the philosophy of the health care system. It is these variables that must be evaluated to determine a method of improving the flow of patients through the surgical critical care units at Letterman Army Medical Center.

The cost of caring for critically ill patients is high, both in terms of resources expended and in patient care provider time expended. At LAMC the Critical Care Committee (CCC) concluded that more efficient use of surgical critical care beds would be through the adjunct use of a Step Down Unit (SDU). This unit would provide a level of care less than that of the ICU, but greater than that of a regular nursing unit. The utility of this unit would be that some patients could be cared for as effectively in a SDU as in the ICU, but more efficiently than in an ICU. That is, some patients could be cared for at less cost in a SDU, thereby providing additional beds in the ICU for more critical patients. To this end, the CCC has established guidelines for admission to, staffing for, and location of a SDU, as a means of improving the flow through the sometimes full surgery ICUs (Appendix B).

Prior to implementation of this type of a unit, a needs assessment and cost-effectiveness analysis are necessary to

determine appropriateness of this proposal as a solution to the problem of congestion in the surgery ICUs. Patterns of ICU and SICU utilization in the treatment of surgical high intensity care patients are analyzed in this study to determine actual utilization as well as the efficiency of these units. Efficiency will be measured using the indicators established by the CCC, that is, if patients fit the criteria for admission to the stepdown unit, then they were not being cared for most efficiently in the ICU. LAMC's surgical critical care bed capacity is limited to a total of ten (10) beds. Four (4) beds are located in the SICU/PAR and six (6) beds are in the combined medical-surgical ICU. In reality, each of the six (6) ICU beds is filled on an availability basis, regardless of the patient's medical or surgical classification.

The population of this study is comprised of all the patients admitted to the ICU during the calendar years 1987-1988. There were 750 patients who were admitted directly to the ICU or came to the ICU through the SICU (PAR ICU). Admission to the ICU was granted, depending on availability, to any patient whose minimum care needs could not be provided for on a regular nursing unit, and in the absence of any intermediate care unit. This study looks at the total patient population of the ICU, regardless of medical or surgical classification, to determine the most efficient use of LAMC's surgery capabilities.

This study population consists of those who meet the

criteria for admission to the SDU as well as those who do not. Populations of this type, ie., that fit into one or the other of two mutually exclusive categories, are dichotomous populations. The subjects have a single choice of two variables, they go to a SDU or they do not. Because there are only two categories, there can be no logical ordering of the categories and the data is said to be nominal. These statistics fall into the broad category of inferential statistics as inferences about the whole population will be possible by studying a subgroup or sample population.

As it would be impractical to examine the records of all 750 patients in the total population, an approximation of the proportion of patients eligible for the SDU may be obtained from a representative sample of the whole population. Blommers and Forsythe hold that for non-parametric (non-normal) distribution, empirical investigations have shown that a sample size equal to or greater than 50 is sufficient to insure representativeness of the population (1977, 288). Further, the central-limit theorem states that as the sample size increases, the probability associated with that statistic being due to chance becomes quite small; that is, the statistic becomes more representative as the sample size increases.

To insure representative of the whole, a sample size of 75 was chosen to be evaluated, exceeding Blommers and Forsyth's rule by 50%. To eliminate sampling bias, a random sample was selected using a table of random numbers (Leedy 1985, 150).

Approximately 90 records were pulled from the files before obtaining 75 that were complete enough for review. The criteria established by the CCC were applied to review the 75 records (Appendix C) to determine what portion, if any, of the total time spent in the surgical critical care units could have been spent in a SDU if one existed (Table I).

TABLE I DESCRIPTIVE STUDY DATA

Number of Patients	75
Category of Patient - Surg:Med	40 Surg : 35 Med
Gender	47 (63%) Male :
	28 (37%) Female
Mean Age	61.73 Years
ICU Deaths	11 (15%)
Days of ICU Care/75 Patients	458 Days
Mean Length of Stay (LOS)	6.11 Days

When assumptions of normality and homogeneity of variance can be made about a population, the method of statistical inference is said to be parametric. However, when the measurement scale of the data is nominal (yes or no), parametric assumptions about the means and variances are inappropriate (Hinkle, Wiersma, and Jurs 1978, 332). When studying the LAMC ICU data it is evident that each patient is different, therefore one can not assume that there would be a normal distribution within the population, nor would there be homogeneity of variance among samples. For such data, non-parametric tests of significance have been developed that do not require assumptions of normality and homogeneity. The tests are analogous to parametric tests, are less restrictive, yet allow the logic of inferential statistics to apply. The non-parametric test of significance for this data is the Chi-square, "Goodness of Fit" analysis, drawn from a one sample test (Hinkle et al., 333). In this analysis, observed frequencies of occurrence are compared to theoretical frequencies (those found in the whole population).

Analysis of the LAMC data will show two things: if the sample is representative of the population, and whether the expected use of a SDU would support developing a SDU. To determine if the sample is representative of the population, we can first compare the mean ages of the patients in the sample and the population. Similarity of mean ages of the sample and the whole population would indicate that the sample is

illustrative of the whole population. If the sample is felt to be representative, inferences can appropriately be made about the whole population based on the sample. The mean ages of the population (62.00 years) and of the sample (61.73 years) clearly correlate without additional testing (Table II).

TABLE II OBSERVATIONS OF ICU DATA

	Population (Expected)	Sample (Observed)
Avg Age	62.004 yrs	61.733 yrs
Gender	64% male	63% male
Expired	11.11%	15%

Secondly, a Chi-square distribution will determine whether the observed frequencies of gender and survival in the sample correlate with the expected frequency of the total population, thereby indicating whether the sample is representative. As with mean ages, similarity of observed and expected frequencies of gender and survival rates would indicate that the sample and the whole population are similar enough to allow inferences to be made about the whole population from the sample. Given the following Chi-square analysis, we can conclude that the sample is representative of the population of 750 patients.

The Chi-square test to compare observed and expected frequencies to determine independence:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

where O = observed frequency

E = expected frequency

k = the number of categories, groupings,
or possible outcomes

GENDER:

H₀ : Assignment to the SDU is independent of gender

H_A : Assignment to the SDU is related to gender

	O	E	O-E	(O-E) ²	$\frac{(O-E)^2}{E}$
Male	63%	64%	-1	1	1
					+
Female	37%	36%	1	1	1
	----	----			---
Total	100%	100%		Chi square=2	

Calculated value of Chi Square = 2

Critical Value = 3.84 (at P=0.05, df=1)

CV is greater than Chi square, therefore we accept the H₀
that the sample is independent and thereby
representative of the population.

SURVIVAL:

H₀ : Assignment to the SDU is independent of survival rate

H_A : Assignment to the SDU is related to survival rate

	O	E	(O-E)	(O-E) ²	$\frac{(O-E)^2}{E}$
Nonsurvivor	15%	11%	4	16	1.46
					+
Survivor	85%	89%	-4	16	0.18
	----	----			---
Totals	100%	100%		Chi-square=1.64	

Calculated value of Chi-square = 1.64

Critical Value = 3.84 (at P=0.05, df=1)

CV is greater than Chi-square, therefore we accept the H₀
that the sample is independent and thereby
representative of the population.

The 75 patient records were carefully examined to

determine the patterns of utilization of the surgical ICUs. Each patient day was evaluated to identify the level of care being delivered, and to identify the proportion of days that each patient could have gone to a SDU. If eight (8) hours or more of care occurred on the day of admission or discharge, that day was counted as a full day of care. Given the very rigorous criteria of the LAMC CCC (Appendix B), only 51 patient days (11.14%) of the 75 patient, two (2) year sample were identified as possible SDU days. Application of the Chi-square "Goodness of Fit" test is used to assess whether or not the observed frequencies of the sample are a "good fit" to the expected frequencies in the total population.

By comparing the expected frequency of SDU use with that observed in the sample, it will be possible to support or reject the hypothesis that a SDU is a useful choice at LAMC. To use the non-parametric Chi-square "Goodness of Fit" based on nominal data and taken from a one sample case, it is necessary to apply the testing procedure on a model. A model can be derived in which the expected frequency would be the optimal SDU patient census per day. For this model, the researcher assumes a bed capacity of three (3) patients daily as being a cost-effective census goal to evaluate the use of a SDU at LAMC. A daily census of 6.6 (based on actual 1987-1988 census data) is used in the model (Table III).

GOODNESS of FIT

H_0 : A SDU is not needed; there is no difference between having a SDU and an ICU versus having only an ICU.
 $((H_0 : (ICU + SDU) - ICU = 0))$

H_A : A SDU is needed; there is a difference between having a SDU and an ICU versus having only an ICU.
 $((H_A : (ICU + SDU) - ICU \neq 0))$

	O	E	(O-E)	(O-E) ²	$\frac{(O-E)^2}{E}$
SDU pts**	.7	3	-2.3	5.29	1.7633
ICU pts	5.9	3.6	2.3	5.29	1.4694
Avg Daily Census	6.6	6.6			
					Chi-square = 3.2327

** $(6.6 * .1114 = .7)$

Calculated value of Chi-square = 3.2327

Critical Value = 3.841 (at $P = 0.05$, $df = 1$)

CV is greater than Chi-square, therefore we accept the H_0 that a SDU is not a useful choice as there is no difference between having an ICU and a SDU versus only having an ICU.

By failing to reject the null hypothesis, (H_0), we conclude that the difference between observed and expected frequencies is not great enough to be attributed to sampling differences. The probability of making a Type I error (rejection of a true hypothesis) is less than 0.05. We further conclude that the sample does not represent a good fit to the expected distribution, using the assumption that a fill rate of three (3) patients is necessary for an efficient unit. We therefore can reject the concept of a SDU as a useful solution to the

problem of overcrowding in the surgical ICUs during the study period of 1987-1988.

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TABLE III
POTENTIAL SDU UTILIZATION

Calculation of SDU utilization, based on study data:

	750	Total population
*	6.1	Avg LOS of sample

	4575	Patient care days (1987-8)
*	11.14	Potential patient care time in SDU

	509.65	= <u>510</u> Patient days possible in <u>2 year</u> sample
	4575/730	3365*23 = <u>6.3</u> Avg daily census (sample data)
	33	(Avg pts/mo) * 6.1 (LOS) = 201 (Avg pt days/mo)
	201/30.5	(Avg dys/mo) = <u>6.6</u> Avg daily census (actual)

Patients needed to fill a four (4) bed SDU per year. All equipment and staffing costs would be the same for a one (1) or a four (4) bed unit.

	365	Days
*	4	Beds

	<u>1460</u>	Bed days per year required to fill SDU
*	2	Years in study sample

	2920	Bed days available (2 years)
-	510	Possible patient days (2 years)

	<u>2410</u>	Bed days deficit (2 years)

Using the criteria of the SDU developed by the CCC, 88.36% of the time, LAMC's critically ill patients required the high-intensity care of the ICU. As it is clear that few patients should be moved to a lesser intensity care area, can it be said that LAMC's ICUs are functioning efficiently? Evaluation of efficiency is difficult as a no acceptable definition of efficiency nor standard level of ICU efficiency has previously existed (Pollack et al. 1987, 1481). Factors unique to individual hospitals and ICUs undoubtedly influence efficiency ratings, prohibiting development of an acceptable standard.

One measure of hospital efficiency has been developed by Pollack in a multi-institutional study of pediatric ICUs. Pollack's definition of an efficiency rating:

$$\frac{\text{Total ICU patient days} - \text{Days of decreased risk, monitored care}}{\text{Total ICU care days}}$$

Where a score of one (1) indicates efficient use of the ICU, while a score of zero (0) indicates only inefficient use (Norton, Finch and Norton 1989, 84). Pollack holds that an efficiency rating of 80% (.80) is reasonable. In the sample of 75 patients at LAMC:

$$\begin{aligned} & \frac{458 \text{ (Total patient days)} - 51 \text{ (Lesser care days)}}{458 \text{ (Total care days)}} \\ & = 0.8886 \text{ Efficiency Rating} \end{aligned}$$

The LAMC CCC accepts the SDU exclusionary criteria as minimal parameters of high intensity, quality care, given their case mix of acute, complex patients. Therefore, an efficiency rating of 0.8886 would indicate that the surgical ICUs operate at an appropriate level of efficiency.

Reliable effectiveness measures in health care delivery are as difficult to identify as efficiency measures. A surrogate measure for effectiveness in health care is a measure of degree of goal achievement. In the provision of health care, this goal is the return to wellness, or survival of the illness episode. Survival rates (without looking at return of quality of life) can be inferred by looking at mortality rates. Griffith offers mortality measures such as maternal and infant deaths and postoperative deaths as reliable hospital performance measures (Griffith 1978, 68). However, there are no national standards as other death rates do not occur uniformly between facilities, and must be looked at as age-specific, disease entity-specific, or institution-specific. It would therefore be unreliable, and improbable that any utility would come of comparison of non-specific death rates in an attempt to measure LAMC's surgical intensive care effectiveness.

Cost-benefit and cost-effectiveness analysis (CBA and CEA) are tools to help identify positive and negative

consequences of choices in the distribution of scarce medical resources. Often confusing terms, CBA and CEA are logical attempts to identify, measure and compare the costs and consequences of a given decision. The primary distinction between them is the process of calculating desirable outcomes of programs. CEA assesses value for money spent, ie., a medical procedure is "cost-effective" if it is "worth" the expenditure of resources used. This type of assessment is necessarily quite subjective as it is an attempt to value "inherent" cost-effectiveness. The CBA allows direct comparison of program benefits in monetary terms. That is, do the costs exceed the benefits; is one program more cost-efficient than another? CBA provides a more quantifiable method of measuring effectiveness than CEA.

The absence of a clear "bottom line" in public health care financing makes CBA considerably more difficult than in the private sector where the profit line is clear. CEA, on the other hand, recognizes the untenability of placing a dollar value on health care outcomes, yet assists the manager in logical assessment of cost per unit of effectiveness among alternatives. The primary difference is that CBA values all costs and benefits in monetary terms, while in CEA, only costs are so valued.

Evaluation of choices for resource allocation at LAMC should be based on the logic of CEA and rational decision making. Comparison of Table III, which projects SDU demand as

510 patient care days in two (2) years, and Appendix F, which projects approximate initial costs plus the first year's costs of a SDU to be approximately \$811,400, shows an unsupportable imbalance in cost of the SDU in relation to the patients that would be cared for. The underlying assumption of the SDU is that as patients are moved to another unit, the ICU beds would then be filled with additional critical care patients, thus offsetting the costs of the new unit. However, this study and the actual census figures show the average ICU daily census to be about 6.6 patients, making it unlikely that an adequate increase in ICU census would occur to balance the costs of a new unit. This information suggests that expansion of surgical ICU capacity is unnecessary and unsupportable at this time at LAMC.

Forecasting the demand for health services plays an essential role in providing adequate care while maintaining reasonable costs. Recent years have seen a tremendous emphasis on improving decision making in the healthcare environment, as resources dwindle and demand for services escalate. The success of decisions to build a new facility, hire new employees, expand existing services, or determine the frequency with which health care is sought, all are closely tied to the ability to predict future need in what is presently a somewhat unstable environment.

Paramount in any decision making process is the ability

to accurately predict the events that surround the decision; then to provide a reasonable estimation of future need. Forecasting future need is tied to several elements common to all situations in which decisions must be made. First is the element of time i.e. the future about which a decision must be made, and changing of that time frame generally alters what that forecast will be and the method by which it will be made. A second element is that of uncertainty. If all the information about a situation were known, the forecasting of future need would be a simple calculation. The third element common to all forecasting decisions, is the reliance on historical data in order to make predictions about future trends. Although other elements may play a role in decision making, these three are common to all forecasting situations.

Identification of LAMC's demand for additional surgical critical care beds (ICU or SDU beds) will assist in the optimum allocation of the hospital's limited resources. The need for capital expenditure and increased staffing requirements relies in part on the anticipated patient census. Time series analysis will trace a pattern in the census data of 1987 and 1988, then project for a similar period. The forecast is related only to time and although not an absolute predictor, can be used in conjunction with other analyses and projections. (Appendices D-E). Analysis of the available information suggests that even with fluctuations in the monthly census, the actual patient population of the ICU appears to have decreased

in the past two years, signaling the continued downward trend noted in the time-series analysis.

To determine appropriateness, the Nurse Workload Management System (NWMS), a patient classification system based on patient acuity and requisite patient care hours, and staffing patterns in the Operating Room and on the various nursing units that receive post-operative patients were reviewed. The Operating Room staffing is flexible within its limits of actual number of staff. Nurse staffing in the surgical ICUs and on the regular nursing units frequently falls short of the guidelines established by the Army Nurse Corps in the WMSN (Vail et al., 1984). Comparison of actual staffing and WMSN requirements during FY88 (Appendix G) shows each unit to be slightly behind requirements of both professional and non-professional staff. Additional patient requirements would necessitate use of additional staffing both for nursing responsibilities and respiratory therapy treatments. An option that is now, and was available during the 1987-1988 study period, would be to rely on agency personnel to make up the shortfall.

Careful review of the 75 patient sample did not show that patients were held in the ICUs secondary to lack of appropriate care on the regular nursing units, but rather, that the physicians kept the patients (89% of the time) for monitoring and care that was too intense for any other type of unit. This

high intensity level of care again reflects the patient mix at LAMC, that of a retired population with its complex medical problems.

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CHAPTER III
CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The options presented at the outset of this study do not offer the best method of improving the flow of patients through the surgical critical care units at Letterman Army Medical Center. The surgical critical care situation was examined by careful review and analysis of the records of one tenth of all the patients admitted to the ICUs at LAMC during the 24 months of 1987-1988. The results of that analysis show that 11.14% of patient bed days could have been spent in a lesser-care unit, a Step Down Unit. Because this figure does not in any way support the utility of a SDU, further statistical analysis of the LAMC data, or a more detailed cost-efficiency analysis of a SDU/expansion of the current ICU capacity, is considered to be unjustified. There are too few patient days of SDU-typical patients to warrant further evaluation.

The LAMC Commander, the Director of the IUCs, and the Chief of Anesthesia, assert that surgeries were postponed or cancelled during the 1987-1988 time frame, and that Emergency Room patients were deferred secondary to lack of ICU bed space. There is an infrequent physician entry in the sample of 75 records reviewed that suggests that patients were sent to regular wards early to make room for more critical patients, only to deteriorate and require readmission to the ICU. It is concern for this readmission of patients which helped prompt this study. However, it appears from the analysis of data that

most (89%) of the patients in the ICU were too critically ill (as per the criteria of the Critical Care Committee) to be moved to a lesser care unit, even if one had existed.

Application of the (study sample) average length of stay (LOS) to the 750 total patients during 1987-1988 shows an average daily census in the ICU/SICU of 6.3 per day. An actual average daily census is 6.6 patients (Table 3 and Appendix D). There are ten (10) beds available to surgical ICU patients, six (6) in ICU and four (4) in PAR/SICU, with accommodation of overflow patients in the Cardiac Care Unit sometimes possible to temporarily alleviate overcrowding. Using either measure, the census falls far short of currently available bed space.

Inspection of the graph "Number of ICU Patients by Month" (Appendix D), reveals a downward trend in the number of patients cared for in the ICU over the two year period ending in December 1988. At this point, there is nothing to indicate that this pattern will change or that additional critical care beds will be necessary. Given cyclic patterns of illness and hospitalizations, there will likely be transient periods when the census exceeds ten (10), creating a crisis in the management of critically ill patients at LAMC. However, any expansion of critical care bed space (ICU, SICU, or SDU beds) cannot be justified when the average daily census falls 3-4 patients short of filling the currently available beds.

RECOMMENDATIONS

Statistically, there is no support for the thesis that additional critical care beds are needed at LAMC to improve the flow of patients through the surgical ICUs, as it is not possible to statistically demonstrate overcrowding. In discussions with many of the staff, both physician and nursing, it is evident that at times there has been an overwhelming census in the critical care units, necessitating delays in the surgery schedule or early transfer of patients to a lesser acute area. As it is not economically feasible to support the expansion of the critical care beds or the implementation of a Step Down Unit, the following recommendations are made as short and long-term solutions.

First, establishment of a 'float pool' of professional and non-professional nurses. Staffing at LAMC typically falls short of the recommended numbers of nurse staffing as recommended by the NWMS (Appendix G), making it difficult for most floors to accept a critical patient who must be transferred out of the ICU to provide additional room for a more acute patient. Although agency nurses are used regularly, it is difficult to obtain an additional nurse during the evening or night shift as a critical need arises. A float pool would consist of two or three nurses assigned to the hospital but 'extra' on a particular shift, or agency nurses who were requested above the minimum needed to staff the hospital for a particular shift. These nurses would then be available to

augment any nursing unit that was designated to accept a critical care patient, but was unable to do so competently with its minimally assigned staff.

Second, scheduling of cardio-thoracic cases for surgery during the early days of the week. Most of these patients require two to four days of high intensity care in the SICU (PAR). The SICU nurses are scheduled to provide 24 hour per day coverage, Monday through Friday, to provide adequate, skilled nursing staff to care for the most intense of the surgical patients operated on at LAMC. If, on a weekend, patients require overnight care in the PAR, the patient is moved to the ICU, which may result in an overcrowded situation, or the nurses who are "on call" provide SICU staffing. This staffing pattern allows for the most efficient possible use of the highly specialized nursing staff. However, careful coordination in the scheduling of "elective" difficult cases early in the week would result in their overnight care occurring during the week when staffing in the PAR/SICU is optimal and the possibility of patient transfer to the ICU is minimal.

Regard for appropriateness of care and allocation of limited resources leads to the third, and most significant, recommendation. Notwithstanding that appropriateness of care is necessarily a subjective measure (it is impossible to place a value on wellness), all candidates for intensive care are either "appropriate", "too well", or "too sick" (Civetta

and Hudson-Civetta 1987, 13). The "appropriate" patient is one who survives with the care delivered in the ICU but who would not survive without it. "Too well" implies that the patient could survive without intensive care; "too sick" describes the patient who does not survive, regardless of the intensive care received. It is difficult to discern those who are "too sick" or "too well" for ICU care until they have received care and their course of illness is clearly defined, making it undesirable to restrict admissions to intensive care or limit the amount and scope of care given.

"ICUs are areas where extraordinary accomplishments and extraordinary waste live side by side, and often where no serious attempt is made to draw a line between the two" (Carlson 1989, 107). Clearly, not all patients can be successfully treated; and the cost in terms of cost to the facility and cost to those who will not be able to receive treatment if the finite funds of public medicine are exhausted must be considered. Careful assessment of severity of illness upon admission, and acceptance of the reality that not all patients will benefit from the best that Medicine has to offer must be part of the therapeutic milieu at Letterman Army Medical Center. Our efforts and treatments should be devoted to those with a reasonable chance of survival, yet we must not prolong the death of those who are dying. In this way, we can better afford to continue to provide care for those who will follow in our ICUs.

APPENDIX

- A. Definitions
- B. Step Down Unit Criteria
- C. Random Sample Worksheet
- D. ICU/SICU Patient Census
- E. Time Series Projection
- F. Approximate Cost for a Four Bed Step Down Unit
- G. Average Nursing Care Hours - WMSN

Definitions

1. Acuity - Measure of severity of illness.
2. Critical Care Units - Surgical Intensive Care Unit (SICU)/Post-Anesthetic Recovery Room (PAR) and the Intensive Care Unit.
3. Effectiveness - Measure of degree of goal achievement.
4. Efficiency - The property of acting with a minimum of expense, effort and waste.
5. Intensive care unit - Nursing unit on which there are specially trained nursing and supportive personnel, and diagnostic and therapeutic equipment necessary to provide specialized medical and nursing care to critically ill patients.
6. Intensivist - Intensive care physician specialist who has completed a fellowship program in intensive care medicine.
7. Post-Anesthetic Recovery Room - Post anesthetic nursing unit providing intense observation and life support to the patient immediately following a surgical procedure.
8. Productivity - Measure of input as compared to output of any given work unit. Included are the concepts of efficiency and effectiveness.

Appendix A

9. Step Down Unit - Surgical nursing unit providing care to those patients who are cardiac and hemodynamically stable, but require close observation and frequent respiratory treatments.



DEPARTMENT OF THE ARMY
LETTERMAN ARMY MEDICAL CENTER
PRESIDIO OF SAN FRANCISCO, CALIFORNIA 94129-6700

REPLY TO
ATTENTION OF:

HSHH-MED

16 June 1988

SUBJECT: Minutes of Ad Hoc Utilization Committee for Critical Care

1. Meeting was held on 16 June 1988 in Room 358.
2. The following members were:

REPRESENTED:

Chief, Dept of Med (Chairman)	COL Charles F. Miller
Director, ICU	COL Nicholas P. Ninos
Chief, Dept of Nursing	COL Lorna Griess
Chief, CSD	LTC George Beringer
Chief, Thoracic Surgery	LTC William Berry
LAMC QA Coordinator	MAJ Glen Sparks
Chief, Pulmonary Svc	MAJ Robert Dietrich
Chief, Respiratory Therapy Svc	Ms. Doris Ketchum

NOT REPRESENTED:

Chief, Hem/Onc Service	LTC Howard Wold
------------------------	-----------------

3. OLD BUSINESS:

a. Minutes of previous meeting were approved without correction.

b. COL Griess reported from a survey of regional medical facilities and none have any type of step-down unit comparable to our proposed unit.

4. NEW BUSINESS:

a. Criteria and requirements for admission to this new unit were determined as following:

- (1) Unit must have availability of EKG monitoring.
- (2) Unit must have availability of pulse oximetry.
- (3) Patients must be cardiac stable/hemodynamically stable.
- (4) Patients will not be directly admitted to this unit from the ER.

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16 June 1988

SUBJECT: Minutes of Ad Hoc Utilization Committee for Critical Care

(5) Dedicated medical equipment, monitors, etc.

b. Patients requiring the following levels of care are specifically excluded from this unit:

- (1) Assisted ventilation.
- (2) Monitored drips.
- (3) Isolation areas.
- (4) 1/1 nursing care.
- (5) Levels of nursing acuity over level 3/4.
- (6) DNR patients.
- (7) Terminally ill patients requiring care and comfort.
- (8) Swan-Ganz Catheters
- (9) Arterial Catheters
- (10) Anticipated length of stay greater than 2 weeks.

c. Area to be used will be area of middle 4 bed bay in the ICU.

d. It was felt that ward clerk from the ICU could do double duty for the new step-down unit.

e. Staff requirements for the unit were as follows:

- (1) 5 RN's
- (2) 5 FTE Respiratory Therapists
- (3) 5 paraprofessionals

f. COL Griess felt it most efficient to ask for volunteers to work on the unit. Discussion was held on personnel experience requirements prior to working in the unit:

- (1) OJT or with experience on Wards 6 or 9.
- (2) Ward RN's with basic ECG monitoring skills.

g. In order to prevent loss of mission authorizations, it was felt that plan needs to be presented to Forces Development and shown as a new mission requiring transfer of current authorizations from units that are being closed, i.e., L&D. COL Griess will contact MAJ Madeo to include this as part of the upcoming TDA study. (COL Griess)

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16 June 1988

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h. It was agreed that bed capacity in the step-down unit would be in relative proportion to decreased bed capacity in the wards, not one for one since there is a higher nurse/patient ratio in the step-down unit.

i. Number of beds in the step-down unit will be based on availability of necessary resources, i.e., respiratory therapy services. Biggest need for step-down unit will be respiratory therapy support because with 4 beds you will need one dedicated respiratory therapist, 24 hours/day. No word has been received on the possible transfer of an enlisted therapist from Fort Campbell. LTC Beringer to check on status. (LTC Beringer)

j. The responsibility for medical and administrative supervision of the unit most logically should rest with the Critical Care Service.

5. RECOMMENDATIONS:

a. The above mentioned criteria for development of this step-down unit be presented to the Hospital QA Committee for referral to the Executive Committee.

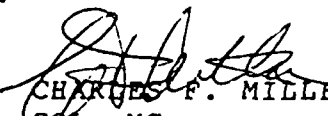
6. ACTIONS PENDING:

a. COL Griess to check on transfer of authorizations with MAJ Madeo. (COL Griess)

b. Status of transfer of respiratory therapist from Fort Campbell. (LTC Beringer)

7. ADJOURNMENT: Meeting was adjourned at 1115 hours. Next meeting will be 28 July 1988.


ANN M. HOBEIKA
Recorder


CHARLES F. MILLER, M.D.
COL, MC
Chief, Dept of Medicine

APPROVED/DISAPPROVED


ROBERT MCAULEY M.D.
COL, MC

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RANDOM SAMPLE WORKSHEET

RANDOM NUMBER

DIAGNOSIS(ES)

	Begin	End
1. Assisted ventilation	-----	-----
2. Monitored drips	-----	-----
3. Isolation precautions	-----	-----
4. Intense nursing care (1:1)	-----	-----
5. Levels of nursing care greater than WMSN category III	-----	-----
6. DNR patient	-----	-----
7. Terminally ill patients requiring care and comfort	-----	-----
8. Swan Ganz catheter	-----	-----
9. Anticipated LOS greater than 2 weeks	-----	-----

Admission : -----

Discharge : -----

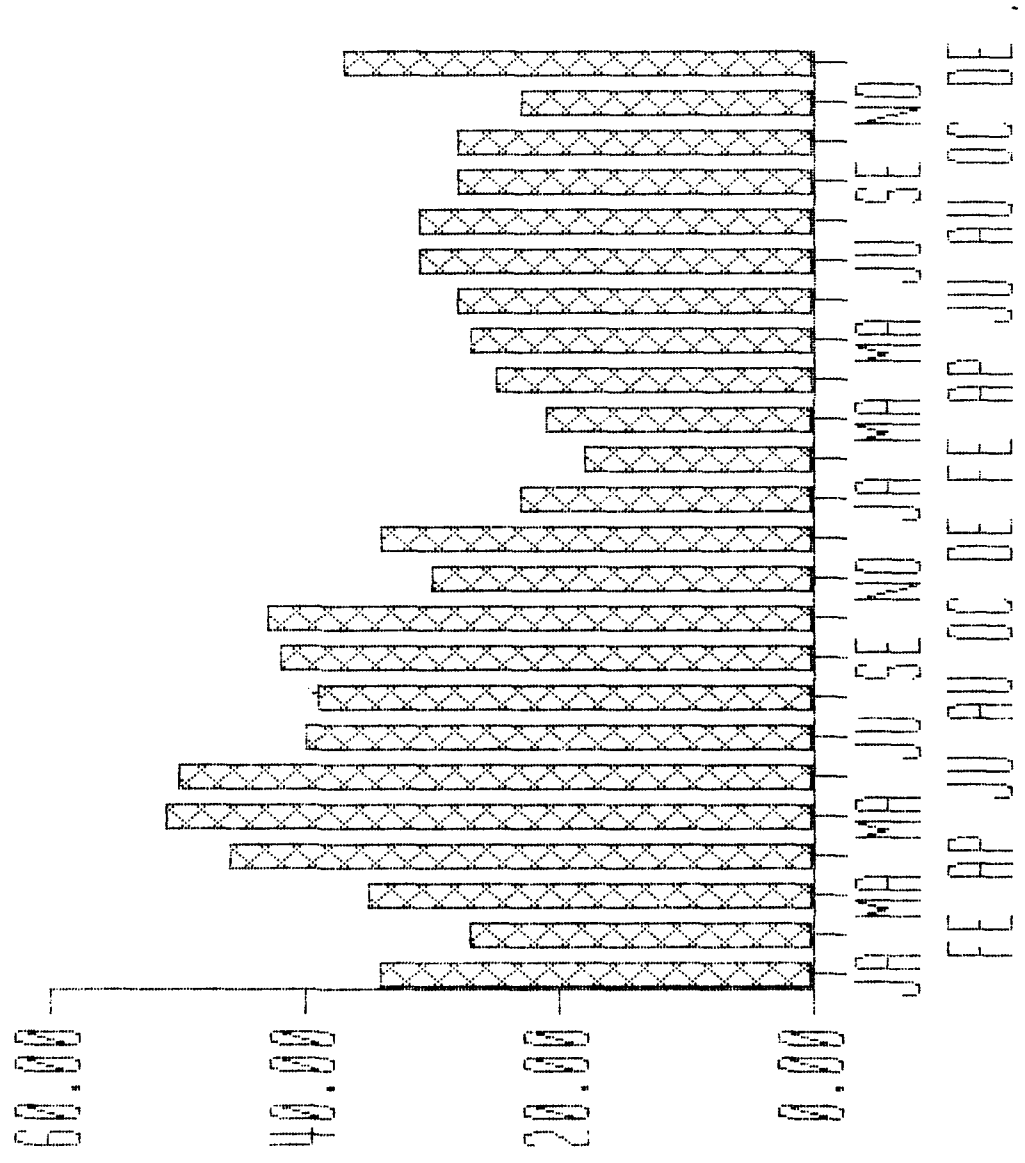
To Ward # -----

Total ICU days : -----

% Possible in SDU : -----

APPENDIX C

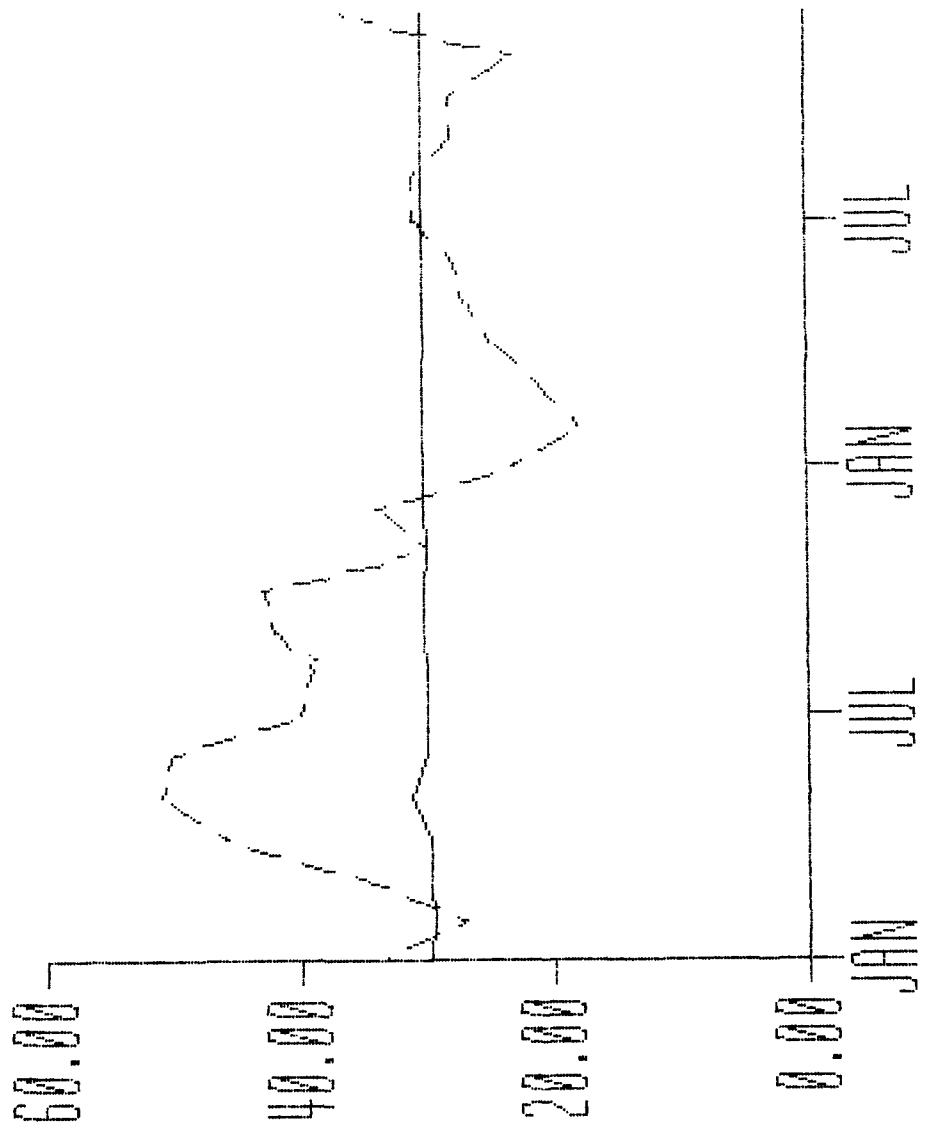
ICU/SICU PATIENT CENSUS (JAN'87 - DEC'88)



ICU/SICU PATIENT CENSUS TIME SERIES PROJECTION

1987-88

1989-90



APPROXIMATE COST FOR A FOUR BED SDU

(INITIAL COSTS + FIRST YEAR COSTS)

EQUIPMENT		SUBTOTAL	<u>\$ 81,000</u>
Critical Care Bed	\$ 6000.00 ea x 4		24,000
Bedside Monitoring System	\$10,000.00 ea x 4		40,000
Central Station Monitors	\$10,000.00 ea x 1		10,000
Bedside Furniture	\$ 500.00 ea x 4		2,000
Nursing Station Furniture	\$ 3,000.00 ea x 1		3,000
Bedside Equipment	\$ 500.00 ea x 4		2,000
(Oxygen, Suction, etc)			

CONSUMABLE SUPPLIES	SUBTOTAL	<u>\$ 96,000</u>
\$6,000.00 per bed per Quarter		
x 4 = \$24,000.00 per Quarter		

STAFFING	SUBTOTAL	<u>\$ 634,000</u>
(Cost reflects <u>minimum</u> agency contract costs		
at LAMC, June 1989)		
Registered Nurses	\$ 62,400 ea x 5	312,000
Licensed Vocational Nurses	\$ 43,680 ea x 5	218,400
Respiratory Therapists	\$ 20,800 ea x 5	104,000

APPROXIMATE TOTAL \$ 811,400

APPENDIX F

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APPENDIX G

*

*

	1987																	RN #	RN REQ WMSN	LVN *-NA * D/E/N/ 5-5/3-3/2-2 3-3/2-3/1-2	LVN REQ NA REQ WMSN WMSN
	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	AVG	D/E/N							
WEST(W.D.)	263	237	215	236	225	212	225	244	234	226	195	189	225	6/4/2	14						
WEST(W.E.)	182	208	168	194	160	193	188	198	210	190	145	144	182	4/3/2	5						
EAST(W.D.)	46	43	46	45	47	49	50	47	50	45	57	49	48	0/0/0	0						
EAST(W.E.)	47	41	45	43	44	49	48	46	46	43	53	48	46	0/0/0	0						
WEST(W.D.)	186	193	193	173	182	193	168	165	166	186	161	169	179	5/3/2	12						
WEST(W.E.)	163	167	159	148	142	156	138	133	141	167	124	128	147	4/2/2	4						
EAST(W.D.)	307	396	351	309	290	297	280	234	229	196	196	153	270	7/5/3	17						
EAST(W.E.)	256	307	269	242	207	232	219	146	161	113	120	96	197	4/4/2	5						
WEST(W.D.)	245	259	221	189	219	232	183	188	166	149	130	170	196	5/4/2	13						
WEST(W.E.)	197	218	184	159	168	180	161	146	162	147	110	170	167	4/3/2	5						
NEAST(W.D.)	121	113	118	100	100	108	74	80	99	107	112	116	104	3/2/1	7						
NEAST(W.E.)	84	80	109	114	94	97	60	57	67	93	69	60	82	2/2/1	3						
WEST(W.D.)	229	249	244	183	254	223	196	206	155	179	180	122	202	6/4/2	14						
WEST(W.E.)	194	229	192	201	186	169	124	143	108	155	158	115	165	4/3/2	5						
AVG(W.D.)	2376	2436	2317	2194	2351	2369	2179	2141	2146	1979	1898	1781	2181								
AVG(W.E.)	1939	2004	1790	1878	1826	1932	1733	1638	1738	1657	1487	1397	1743								

*WMSN Requirements include CHN, WM, and Ward Clerk

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